Port of Pascagoula, Mississippi, After Action Report

Introduction.

A Port Risk Assessment was conducted for the port of Pascagoula, Mississippi, 9 and 11 August 1999. This report will provide the following information:

- Brief description of the process used for the assessment;
- List of participants;
- Numerical results from the Analytical Hierarchy Process (AHP); and
- Summary of risks and mitigations discussion.

Follow-on strategies to develop and implement VTM improvements aimed at reducing risks will be the subject of a separate report.

Process.

The risk assessment process is a disciplined approach to obtaining expert judgements on the level of waterway risk. The process also addresses the relative merit of specific types of Vessel Traffic Management (VTM) improvements for reducing risk in the port. Based on the Analytic Hierarchy Process (AHP)[1], the port risk assessment process involves convening a select group of expert/stakeholders in each port and conducting structured workshops to evaluate waterway risk factors and the effectiveness of various VTM improvements. The process requires the participation of local Coast Guard officials before and throughout the workshops. Identification of local risk factors/drivers and selecting appropriate risk mitigation measures is thus accomplished by a joint effort involving experts and stakeholders, including both waterway users and the agencies/entities responsible for implementing selected risk mitigation measures.

This methodology hinges on the development of a generic model of vessel casualty risk in a port. Since risk is defined as the product of the probability of a casualty and its consequences, the model includes variables associated with both the causes and the effects of vessel casualties. The model uses expert opinion to weight the relative contribution of each variable to the overall port risk. The experts are then asked to establish scales to measure each variable. Once the parameters have been established for each risk inducing factor, the port's risk is estimated by inputting values for the variables specific to that port into the risk model. The model also produces an index of relative merit for five VTM levels as perceived by the local experts assembled for each port.

[1] Developed by Dr Thomas L. Saaty, et al to structure complex decision making, to provide scaled measurements, and to synthesize many factors having different dimensions.

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Participants.

The following is a list of stakeholders/experts that participated in the process (Ant Mobile combined with CWO Seymour):

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Numerical Results.

Book 1 - Factors *(Generic Weights)*

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Short-term Consequences	Long-term Consequences
10.2	**12.5**	**36.0**	**17.8**	**9.4**	**14.1**

Analysis:

The participants contributed the above scores to the National Model. They determined that

- The Waterway Configuration Was The Most Risky Factor At 36 Percent
- Followed By Waterway Configuration,
- Followed By Long Term Consequences.

Book 2 - Subfactors *(Generic Weights)*

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Short-term Consequences	Long-term Consequences
100	100	100	100	100	100
% High Risk Deep Draft	Volume Deep Draft	Wind Conditions	Visibility Obstructions	Volume of Passengers	Economic Impacts
23.8	10.0	15.9	35.7	41.4	39.2
% High Risk Shallow Draft	Volume Shallow Draft	Visibility Conditions	Passing Arrangements	Volume of Petroleum	Environmental Impacts
76.2	13.5	56.3	29.1	25.4	27.4
	Vol. Fishing && Pleasure Craft	Currents, Tides, Rivers	Channel and Bottom	Volume of Chemicals	Health && Safety Impacts
	35.6	17.2	16.2	33.2	33.4
	Traffic Density	Ice Conditions	Waterway Complexity		
	40.9	10.7	19.0		

Analysis:

The participants contributed the above results to the national model. In particular, they determined that the following subfactors provided the greatest risk of a casualty:

- For Fleet Composition, High Risk Shallow Draft
- For Traffic Conditions, Volume Of Fishing And Pleasure Craft
- For Navigation Conditions, Visibility
- For Waterway Configuration, Visibility Obstructions
- For Short Term Consequences, Volume Of Passengers
- For Long Term Consequences, Economic Impacts

Book 3 *Subfactor Scales - Condition List (Generic)*

	Scale Value
Wind Conditions	
a. Severe winds < 2 days / month	1.0
b. Severe winds occur in brief periods	2.7
c. Severe winds are frequent & anticipated	5.0
d. Severe winds occur without warning	9.0
Visibility Conditions	
a. Poor visibility < 2 days/month	1.0
b. Poor visibility occurs in brief periods	2.6
c. Poor visibility is frequent & anticipated	4.8
d. Poor visibility occurs without warning	9.0
Current, Tide or River Conditions	
a. Tides & currents are negligible	1.0
b. Currents run parallel to the channel	1.9
c. Transits are timed closely with tide	5.1
d. Currents cross channel/turns difficult	9.0
Ice Conditions	
a. Ice never forms	1.0
b. Some ice forms-icebreaking is rare	2.4
c. Icebreakers keep channel open	5.5
d. Vessels need icebreaker escorts	9.0
Visibility Obstructions	
a. No blind turns or intersections	1.0
b. Good geographic visibility-intersections	2.1
c. Visibility obscured, good communications	4.9
d. Distances & communications limited	9.0
Passing Arrangements	
a. Meetings & overtakings are easy	1.0
b. Passing arrangements needed-ample room	2.1
c. Meetings & overtakings in specific areas	6.0
d. Movements restricted to one-way traffic	9.0
Channel and Bottom	
a. Deep water or no channel necessary	1.0
b. Soft bottom, no obstructions	2.2
c. Mud, sand and rock outside channel	5.2
d. Hard or rocky bottom at channel edges	9.0
Waterway Complexity	
a. Straight run with NO crossing traffic	1.0
b. Multiple turns > 15 degrees-NO crossing	2.7
c. Converging - NO crossing traffic	4.9
d. Converging WITH crossing traffic	9.0
Passenger Volume	
a. Industrial, little recreational boating	1.0
b. Recreational boating and fishing	3.3
c. Cruise & excursion vessels-ferries	5.8
d. Extensive network of ferries, excursions	9.0

Petroleum Volume

a. Little or no petroleum cargoes	1.0
b. Petroleum for local heating & use	2.7
c. Petroleum for transshipment inland	5.6
d. High volume petroleum & LNG/LPG	9.0

Chemical Volume

a. Little or no hazardous chemicals	1.0
b. Some hazardous chemical cargo	2.6
c. Hazardous chemicals arrive daily	5.5
d. High volume of hazardous chemicals	9.0

Economic Impacts

a. Vulnerable population is small	1.0
b. Vulnerable population is large	3.1
c. Vulnerable, dependent & small	5.2
d. Vulnerable, dependent & Large	9.0

Environmental Impacts

a. Minimal environmental sensitivity	1.0
b. Sensitive, wetlands, VULNERABLE	2.7
c. Sensitive, wetlands, ENDANGERED	5.8
d. ENDANGERED species, fisheries	9.0

Safety and Health Impacts

a. Small population around port	1.0
b. Medium - large population around port	2.4
c. Large population, bridges	5.5
d. Large DEPENDENT population	9.0

Analysis:

The participants contributed their determination of the degree of severity of risk the above subfactors on the national model. Each subfactor above has a high and a low severity limit of 9 and 1 respectively. Inside those limits, the participants determined the scale of risk for the two intermediate risk measures.

Book 4 *Risk Subfactor Ratings (Pascagoula)*

Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Short-term Consequences	Long-term Consequences
% High Risk Deep Draft	Volume Deep Draft	Wind Conditions	Visibility Obstructions	Volume of Passengers	Economic Impacts
4.0	3.5	5.6	2.9	3.3	4.3
% High Risk Shallow Draft	Volume Shallow Draft	Visibility Conditions	Passing Arrangements	Volume of Petroleum	Environmental Impacts
6.2	6.7	5.6	7.8	8.5	7.3
	Vol. Fishing && Pleasure Craft	Currents, Tides, Rivers	Channel and Bottom	Volume of Chemicals	Health && Safety Impacts
	6.6	3.1	3.8	5.7	1.4
	Traffic Density	Ice Conditions	Waterway Complexity		
	7.5	1.0	8.7		

Analysis:

Based on the input from the participants, the following top risks occur in Port Arthur (in order of importance):

1. Waterway Complexity
2. Volume of Petroleum
3. Passing Arrangements
4. Traffic Density
5. Environmental Impacts

	Fleet Composition	Traffic Conditions	Navigational Conditions	Waterway Configuration	Short-term Consequences	Long-term Consequences	Relative Merit Index
VTS	32.4	44.0	42.3	40.0	42.9	41.3	**41.0**
VTIS	30.1	22.8	21.7	23.2	21.8	21.7	**23.0**
EAIS	16.7	14.9	17.1	17.4	17.1	17.6	**16.9**
AIS	11.9	10.0	11.3	11.8	11.2	11.3	**11.3**
Improve Current System	8.8	8.3	7.7	7.6	7.1	8.1	**7.9**

Analysis:

This table shows that the participants believe that the tool of VTS will contribute the greatest potential for risk mitigation. This is followed closely by VTIS and EAIS.

PARTICIPANT IDENTIFIED RISKS AND MITIGATIONS

FACTOR/ SUB-FACTOR	IDENTIFIED RISKS	SUGGESTED MITIGATIONS
Fleet Composition % High Risk Deep Draft Vessels % High Risk Shallow Draft Vessels	• Impact of fatigue on operators of shallow draft vessels • Shrimpers from outside the local area and some ICW users not familiar with area • Failure of vessels transiting ICW to communicate with local traffic • Uncontrolled/unstructured movement of shallow draft vessels outside of marked channels introduces unpredictability • Failure of recreational craft to observe rules of the road • Outages and icing degrade ATON effectiveness • Over 80% of fishing (shrimping) vessels are difficult to communicate with • Failure to communicate caused by distraction of operator	• Improve security call procedures/requirements
Traffic Conditions Volume of Deep Draft Vessels Volume of Shallow Draft Vessels		

FACTOR/ SUB-FACTOR	IDENTIFIED RISKS	SUGGESTED MITIGATIONS
Volume of Fishing and Pleasure Craft	• Fishing (shrimping) vessels in waterway	• Prohibit fishing (shrimping) activities in channels • Increase educational activities • Enforce existing regulations
Traffic Density	• Diverse mix of deep and shallow draft vessel types	• AIS planning needs to include fishing (shrimping) vessels and recreational boats
Navigational Conditions Wind Conditions	• Shrimpers from outside the local area and some ICW users not familiar with area • Unpredictable thunder showers and squalls cause strong winds • Strong seasonal winds in winter and squalls in summer • Lack of real-time weather and forecast weather information • Wind caused breakaways from barge fleeting area in Pascagoula Harbor creates problems	• Improve content and distribution of Local NTM and local operating procedures • Install real-time weather station with direct access to data
Visibility Conditions	• Fog conditions vary in port (mostly in spring, fall and winter) • Heavy rain reduces visibility • Lack of real-time weather and forecast weather information • Fog impacts scheduling of ship movements	• Require precision navigation capabilities for low visibility movement • Broaden restrictions on movements in low visibility to all vessels • Install real-time weather station with direct access to data
Currents, Tides and Rivers	• Strong currents at barrier island entrance(s) • Operators from outside local area	• Install real-time tide and current station with direct access to data

FACTOR/ SUB-FACTOR	IDENTIFIED RISKS	SUGGESTED MITIGATIONS
Ice Conditions	unfamiliar with tidal fluctuation and cross currents • Lack of real-time tide and current information	
Waterway Configuration		
Visibility Obstructions	• Cannot see into Pascagoula Harbor from Main Ship Channel • Configuration of Bayou Casotte entrance channel precludes seeing harbor • Background lighting and moored vessels obscure range lights and daymarks • Bayou Casotte front range difficult to identify	
Passing Arrangements	• Dredges don't follow normal traffic flow • Movement of oil rigs requires closure of waterways	• Continue practice of waterway closures during rig movement
Channel and Bottom	• Portion of Horn Island Channel very narrow and subject to shoaling	
Waterway Complexity	• Narrow channel in Bayou Casotte causing vessel movement problems • Barge fleeting area in Pascagoula Harbor obstructs navigation • Tows frequently damage ICW fixed ATON	• Move barge fleeting area to Bayou Casotte

FACTOR/ SUB-FACTOR	IDENTIFIED RISKS	SUGGESTED MITIGATIONS
	structures • Westbound ICW and Bayou Casotte traffic cuts corner at "Y"	
Short-Term Consequences Number of People on Waterway		
Volume of Petroleum Cargoes	• High volume of petroleum products moving on tankers and barges	
Volume of Hazardous Chemical Cargoes	• High volume of hazardous material moving in ICW	
Long-Term Consequences Economic Impacts	• Hazardous spill could cause severe impact on shrimpers, oystermen and tourist industry • Channel blockage will cause severe economic impact to port industries within 36 hours	
Environmental Impacts	• Large expanse of environmentally sensitive wetland (in river and east of Bayou Casotte) and barrier island areas	
Health and Safety Impacts		